CLAIMS

What is claimed is:

1. A method for concealing errors in video data, comprising:

decoding a first set of motion vectors in a corrupted video packet;

estimating a second set of remaining motion vectors in the corrupted video packet;

performing motion compensated temporal replacement of texture data using said first and second sets of motion vectors;

evaluating image smoothness of the texture data;

repeating said decoding, estimating, performing, and evaluating with one less motion vector in the first set and one more motion vector in the second set, said repeating done until there is no more motion vector left in the first set; and

selecting sets of motion vectors from said first and second sets to replace motion vectors in said corrupted video packet, where said sets of motion vectors produce a best image smoothness measure of said texture data.

2. The method of claim 1, further comprising:

determining presence of motion vector errors in the corrupted video packet.

3. The method of claim 2, wherein the presence of motion vector errors is detected by monitoring invalid variable length code.

4. The method of claim 1, wherein the first and second sets of motion vectors are motion vectors for macroblocks in the video packet.

5. The method of claim 4, wherein initially the first set of motion vectors includes motion vectors for macroblocks prior to a location of detected error, and the second set of motion vectors includes motion vectors for macroblocks subsequent to the location of detected error.

6. The method of claim 1, wherein said estimating the second set includes taking an average of motion vectors of non-corrupted neighboring macroblocks.

7. The method of claim 1, wherein said estimating the second set includes taking a median of motion vectors of non-corrupted neighboring macroblocks.

8. The method of claim 1, wherein said performing motion compensated temporal replacement includes restoring texture data of macroblocks by propagating texture data from a previous frame using said first and second sets of motion vectors.

9. The method of claim 1, wherein said evaluating image smoothness includes measuring smoothness of macroblock boundaries in the restored texture data.

10. The method of claim 9, wherein said measuring smoothness of macroblock boundaries includes measuring the image smoothness spatially.

11. The method of claim 10, wherein said measuring includes summing pixel value mismatch between macroblock boundary pixels.

12. The method of claim 11, wherein said best image smoothness measure provides a lowest pixel value mismatch of the macroblock boundary pixels.

13. The method of claim 9, wherein said measuring smoothness of macroblock boundaries includes measuring the image smoothness temporally.

14. The method of claim 13, wherein said measuring includes summing pixel value mismatch of surrounding area between a current frame and a motion compensated previous frame.

15. The method of claim 14, wherein said best image smoothness measure provides a lowest pixel value mismatch of surrounding area between a current frame and a motion compensated previous frame.

16. The method of claim 1, further comprising:

processing said selected first and second sets of motion vectors in a reverse direction.

17. The method of claim 16, wherein said processing includes replacing some of the second set of estimated motion vectors with decoded motion vectors.

18. The method of claim 17, wherein said replacing includes

creating a candidate motion vector set by combining said first set of motion vectors with said second set of motion vectors, where an estimated motion vector at the end of said second set of motion vectors is replaced with a decode motion vector.

19. The method of claim 18, further comprising:

performing motion compensated temporal replacement of texture data using said candidate motion vector set.

20. The method of claim 19, further comprising:

evaluating an image smoothness of the motion compensated texture data.

21. The method of claim 20, further comprising:

repeating said creating, performing, and evaluating with one more decoded motion vector replacing the estimated motion vector.

22. The method of claim 21, wherein said repeating is done until all the motion vectors in the second set is replaced with decoded motion vectors.

23. The method of claim 22, further comprising:

selecting a set of motion vectors that provides best image smoothness, where said set of motion vectors are used to replace the motion vectors in the corrupted video packet.

24. A method for concealing errors in video data, comprising:

creating a first set of motion vectors having decoded motion vectors prior to a location of error and estimated motion vectors subsequent to the location of error;

performing motion compensated temporal replacement of texture data using said first set of motion vectors;

evaluating image smoothness of the texture data;

repeating said creating, performing, and evaluating with one less decoded motion vector and one more estimated motion vector, to generate a plurality of said first set of motion vectors, said repeating done until there is no more decoded motion vector left; and

selecting a best set of motion vectors from said plurality of said first set of motion vectors to replace corrupted motion vectors in said video packet, where said best set of motion vectors produce a best image smoothness measure of said texture data.

25. An error concealment system, comprising:

an error location detector to determine location of video packet error;

a motion vector estimator to estimate motion vectors;

a motion compensated temporal replacement element arranged to receive decoded motion vectors and estimated motion vectors, said replacement element operating to perform motion compensated temporal replacement of texture data using said decoded and estimated motion vectors;

an image smoothness evaluator to evaluate smoothness of a series of replaced texture data; and

a best smoothness selector to select a set of motion vector that produces best image smoothness.

26. The system of claim 25, further comprising:

an error detector to detect presence of motion vector errors in a corrupted video packet.

27. The system of claim 26, wherein the presence of motion vector errors is detected by monitoring invalid variable length code.

28. The system of claim 25, wherein said motion vector estimator includes an averaging element to average motion vectors of non-corrupted neighboring macroblocks.

29. The system of claim 25, wherein said motion vector estimator includes a median calculator to compute a median of motion vectors of non-corrupted neighboring macroblocks.

30. The system of claim 25, wherein said motion vector estimator initially estimates motion vectors for macroblocks subsequent to the location of detected error.

31. The system of claim 25, wherein said motion compensated temporal replacement element initially decodes motion vectors for macroblocks prior to the location of detected error.

32. The system of claim 25, wherein said image smoothness evaluator includes an accumulator and a differencing element to sum pixel value mismatch between macroblock boundary pixels.

33. The system of claim 25, further comprising:

a selector to select a set of motion vectors that provides best image smoothness.